3E. Geology and Soils

The purpose of this section is to evaluate the proposed project's impacts on local geological features and whether it would expose people or structures to adverse geological impacts. Potential geologic hazards include seismically induced groundshaking, fault rupture, liquefaction, landsliding, and weak or unstable soil conditions.

3E.1 Environmental Setting

Occidental College is located on a hillside area at the southern end of the San Rafael Hills between the Los Angeles River and the Arroyo Seco. Regionally the campus and surrounding area is in the Transverse Ranges geomorphic province near the boundary of the Peninsular Ranges geomorphic province. The Transverse Ranges geomorphic province is characterized by east-west trending geologic structures, including the Hollywood Fault, the Raymond Fault, the Santa Monica Mountains, and the San Rafael Hills. In contrast, the Peninsular Ranges geomorphic province is characterized by northwest trending geologic structures, including the Newport-Inglewood Fault Zone. In the site vicinity, the boundary between these provinces is the Raymond and Hollywood faults, located approximately 0.2 miles south-southeast and 1.5 miles west-southwest of the site, respectively.

Surface Conditions

The surface materials located at the project area are underlain by sedimentary bedrock of the Miocene Age Topanga Formation. The Topanga Formation bedrock underlying the project area is composed of conglomerate that is typically moderately- to well-cemented, massive, and matrix supported with varying amounts of gravel-size clasts. The conglomerate matrix typically consists of well-graded sand and the clast size ranges from gravel to cobbles. The bedrock is moderately jointed. Caliche-filled irregular and discontinuous joints were located on local cut slopes adjacent to an area of a former ravine that was filled as part of a separate land development. Some shears consisting of seams of sheared clay gouge materials up to 4 inches thick are present on the surface of the project area (Law Gibb Group, 2001). These shears are believed to be related to regional tectonic deformation. In addition, according to the City of Los Angeles Safety Element (1996) and the County of Los Angeles Seismic Safety Element (1990), the campus is classified as being within a "hillside area", as well as within a City of Los Angeles Slope Stability Study Area, as designated by the City of Los Angeles Planning Department (1975) (GeoDesign, 2005).

Subsurface Conditions

The project area is mantled by artificial fill, which is underlain by residual and colluvial soils, which in turn are underlain by sedimentary bedrock of Miocene Age Topanga Formation. The area includes artificial fill and colluvium that ranges in thickness from 1 to 58 feet and consists of brown and gray clayey sand, silty sand, and sand with some gravel and bedrock fragments. Debris such as wood, brick, and concrete also is found in the fill material. Colluvium ranges in thickness from 1.5 to 12 feet and consists of reddish-brown silty sand. Deeper fill could be present at the site, particularly near the center of the former ravine. Deeper fill could be present at the site, particularly near the center of the former ravine. The residual soil/colluvium present at the project area consists of sand, silty sand, clayey sand and sandy clay and ranges from approximately 4 to 16.5 feet thick. As mentioned, the project site is located within a hillside that is elevated above the groundwater basin. Other than some localized seepage associated with perched groundwater, no significant amounts of groundwater were encountered in borings drilled for a geotechnical evaluation of the recently completed student housing located at the south end of the campus (GeoDesign, 2005).

Geologic Hazards

Regional Faults

Southern California is a seismically active region and prone to earthquakes, which may result in hazardous conditions to people within the region. Earthquakes and ground motion can affect a widespread area. The potential severity of ground shaking depends on many factors, including the distance from the originating fault, the earthquake magnitude and the nature of the earth materials beneath the site.

The campus is located at the toe of a west-facing slope at the southern end of the San Rafael Hills between the Los Angeles River and Arroyo Seco. Regionally, this area is in the Transverse Ranges geomorphic province near the boundary of the Peninsular Ranges geomorphic province. The Transverse Ranges geomorphic province is characterized by east-west trending geologic structures such as the Hollywood fault, the Raymond fault and the Santa Monica Mountains. The Peninsular Ranges geomorphic province is characterized by north-west trending geologic structures such as the Newport-Inglewood fault zone. The project area is located between these provinces.

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Division of Mines and Geology (CDMG) for the Alquist-Priolo (A-P) Earthquake Fault Zoning Program (Hart, 1997). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault is a fault that has demonstrated surface displacement of Quaternary age deposits (last 1.6 million years). Inactive faults have not moved in the last 1.6 million years. A list of nearby active faults and the distance in miles between the nearest point on the fault and the project area, the magnitude of the maximum credible earthquake, and the slip rate for the fault is given in **Table 3E-1**. A similar list for potentially active faults is presented in **Table 3E-2**.

The primary purpose of the A-P Earthquake Fault Zoning program is to identify sites that have a potential for surface rupture due to active faults that are in close proximity to the project area. In such cases, a building setback zone is established to mitigate the potential for surface rupture.

According to the Geotechnical Study performed by GeoDeisgn, Inc. for a project located at the very southern end of the campus, the closest fault to the project area capable of surface rupture is

TABLE 3E-1
MAJOR NAMED FAULTS CONSIDERED ACTIVE IN SOUTHERN CALIFORNIA

Fault (in increasing distance)	Magnitude (Maximum Credible Earthquake)	Slip Rate (mm/yr.)	Distance from Site (Miles)	Direction from Site
Hollywood	6.4 RO	1.0	3	W
Newport-Inglewood Zone	6.9 SS	1.0	12	SW
Compton-Los Alamitos Thrust	6.8 RO	1.5	20	S
Northridge Thrust	6.9 RO	1.5	11	NW
Malibu Coast	6.7 RO	0.3	27	W
Anacapa-Dume	7.3 RO	3.0	8.6	SW
Raymond	6.5 RO	0.5	0.2	SE
Verdugo	6.7 RO	0.5	4	N
Elysian Park Thrust	6.7 RO	1.5	10.5	SE
Palos Verdes	7.1 SS	3.0	13	SW
San Fernando	6.7 RO	2.0	11	N
Sierra Madre	7.0 RO	3.0	11	E
San Gabriel	7.0 SS	1.0	28	N
Whittier	6.8 SS	2.5	22	SE
Oak Ridge	6.9 RO	4.0	45	NW
San Cayetano	6.8 RO	6.0	40	NW
San Andreas (Southern Segment)	7.4 SS	24.0	30	NE
Cucamonga	7.0 RO	5.0	30	E
Elsinore (Glen Ivy Segment)	6.8 SS	5.0	40	SE
San Jacinto (San Bernardino Segment)	6.7 SS	12.0	50	E

Notes: SS Strike Slip: chiefly vertical faults that have shifted rocks on one side of the fault horizontally in relation to the opposite side.
NO Normal Oblique: faults that have significant components of both strike and dip (faults that have changed the elevation of a rock mass on one side of the fault relative to the opposite mass) slips and the side above the fault is depressed.
RO Reverse Oblique: faults that have significant components of both strike and dip slips and the side above the fault is elevated.

SOURCE: California Division of Mines and Geology, "Probabilistic Seismic Hazard Assessment for the State of California" *Open File Report 96-08*, 1996.

the Raymond Fault, located approximately 0.2 miles south-southeast of the southern boundary of the project area. The Raymond Fault is considered to be active by the City of Los Angeles and the State Geologist for the purposes of planning and development. An A-P Zone has been established for the nearby segment of the Raymond Fault. At its closest point, the A-P zone is located approximately 800 feet south-southeast of the campus.

The active Puente Hills Blind Thrust and the active Upper Elysian Park Fault are located within close proximity to the project area. These are deep thrust faults (at depths typically greater than three kilometers) that do not extend to the ground surface and do not present a surface fault rupture hazard. However, these features are considered active seismic sources that could generate significant ground motion at the project area if an earthquake were to occur along one of these deep thrust faults.

TABLE 3E-2
MAJOR NAMED FAULTS CONSIDERED POTENTIALLY ACTIVE IN SOUTHERN CALIFORNIA

Fault (in increasing distance)	Magnitude (Maximum Credible Earthquake)		Slip Rate (mm/yr.)	Distance From Site (Miles)	Direction From Site
Overland	6.0	SS	1.0	2.7	SSW
Charnock	6.5	SS	1.0	4.0	SW
MacArthur Park	5.7	RO	1.0	4.5	ENE
Coyote Pass	6.7	RO	1.5	10.5	ESE
Northridge Hills	6.6	SS	1.5	12	NNW
Santa Susana	6.6	RO	0.3	18	NW
Norwalk	6.7	RO	3.0	21	SE
Los Alamitos	6.2	SS	0.5	22	SE
Duarte	6.7	RO	0.5	23	ENE
Clamshell-Sawpit	6.5	RO	1.5	23	ENE
San Jose	6.5	RO	3.0	29	E
Holser	6.5	RO	2.0	30	NW
Indian Hill	6.6	RO	3.0	31	E

Notes: SS Strike Slip: chiefly vertical faults that have shifted rocks on one side of the fault horizontally in relation to the opposite side.
NO Normal Oblique: faults that have significant components of both strike and dip (faults that have changed the elevation of a rock mass on one side of the fault relative to the opposite mass) slips and the side above the fault is depressed.
RO Reverse Oblique: faults that have significant components of both strike and dip slips and the side above the fault is elevated.

SOURCE: Slemmons, D.B. "Evaluation of Geomorphic Features of Active Faults For Engineering Design and Siting Studies," Association of Engineering Geologists Short Course, 1979; Mark, R.K., "Application of Linear Statistical Models of Earthquake Magnitude Versus Fault Length in Estimating Maximum Expectable Earthquakes," *Geology*, Vol. 5, pp. 464-466, 1977; California Division of Mines and Geology, "Probabilistic Seismic Hazard Assessment for the State of California" *Open File Report 96-08*, 1996; Wesnousky, S.G., "Earthquakes, Quaternary Faults and Seismic Hazard in California," *Journal of Geophysical Research*, Vol. 91, No. B12, pp. 12,587-12,631, 1986; Hummon, C., Schnieder, C.L., Yeats, R.S., Dolan, J.F., Sieh, K.E., and Huftile, G.J., "Wilshire Fault: Earthquakes in Hollywood," *Geology*, Vol. 22, pp. 291-294, 1994.

Seismic Events

Five moderate earthquakes have impacted the Los Angeles Basin in the last 60 years, including the Long Beach earthquake of 1933, the San Fernando earthquake of 1971, the Whittier Narrows earthquake of 1987, the Sierra Madre earthquake of 1991 and the recent Northridge earthquake of 1994. These earthquakes caused major damage to structures and substandard construction, largely due to liquefaction.

Liquefaction

Liquefaction involves the sudden loss of strength in saturated, cohesionless soils (predominantly sand) during a seismic event. This phenomenon results in elevated pore-water pressures that temporarily transform the soil into a fluid mass resulting in vertical settlement and could include lateral deformations. Typically, liquefaction occurs in areas where groundwater is less than 50 feet from the surface and where the soils are comprised of predominantly poorly consolidated sands.

Liquefaction generally occurs in saturated, loose-to-medium dense, granular soils and in saturated, soft-to-moderately firm silts as a result of strong ground shaking. As the density and/or particle size of the soil increases and as the confinement increases, the potential for liquefaction decreases.

3E.2 Regulatory Background

Federal

National Pollutant Discharge Elimination System and the Clean Water Act

Water pollution degrades surface waters making them unsafe for drinking, fishing, swimming, and other activities. As authorized by the Clean Water Act (CWA), the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Although individual homes that are connected to a municipal system use a septic system, or do not have a surface discharge do not need an NPDES permit; industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to our Nation's water quality (USEPA, 2008).

CWA Section 402 establishes the NPDES permit program to regulate point source discharges of pollutants into waters of the United States. An NPDES permit sets specific discharge limits for point sources discharging pollutants into waters of the United States and establishes monitoring and reporting requirements.

Although EPA is charged with administering the NPDES permit program, it can authorize states to assume many of the permitting, administrative, and enforcement responsibilities of the NPDES permit program. Authorized states are prohibited from adopting standards that are less stringent than those established under the Federal NPDES permit program, but may adopt or enforce standards that are more stringent than the Federal standards if allowed under state law (USEPA, 2008).

State

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 requires that special geologic studies be conducted to locate and assess any active fault traces in and around known active fault areas prior to development of structures for human occupancy. This law was a direct result of the 1971 San Fernando earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures.

The Alquist-Priolo Act's main purpose is to prevent the construction of buildings used for human occupancy on the surface trace of active faults. This Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The law requires the State Geologist to establish regulatory zones (Earthquake Fault Zones) around the surface traces of active faults and to issue appropriate maps. These maps (Alquist-Priolo Maps) are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local cities and counties must regulate certain development projects within the zones that include withholding permits until geologic investigations demonstrate that development sites are not threatened by future surface displacement. Projects include all land divisions and most structures for human occupancy.

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act of 1990 addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides. The purpose of the Act is to protect public safety from the effects of strong ground shaking, liquefaction, landslides, or other ground failure, and other hazards caused by earthquakes. This Act requires the State Geologist to delineate various seismic hazard zones and requires cities, counties, and other local permitting agencies to regulate certain development projects within these zones. Before a development permit is granted for a site within a seismic hazard zone, a geotechnical investigation of the site has to be conducted and appropriate mitigation measures incorporated into the project design. Seismic Hazard maps have been completed for much of the southern California region.

California Building Code

The California Building Code (CBC) has been codified in the California Code of Regulations (CCR) as Title 24, Part 2. Title 24 is administered by the California Building Standards Commission, which, by law, is responsible for coordinating all building standards. Under state law, all building standards must be centralized in Title 24 or they are not enforceable. The purpose of the CBC is to establish minimum standards to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, and general stability by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all building and structures within its jurisdiction. The CBC is based on the International Building Code. The 2007 CBC is based on the 2006 International Building Code (IBC) published by the International Code Conference. In addition, the CBC contains necessary California amendments which are based on the American Society of Civil Engineers (ASCE) Minimum Design Standards 7-05. ASCE 7-05 provides requirements for general structural design and includes means for determining earthquake loads as well as other loads (flood, snow, wind, etc.) for inclusion into building codes. The provisions of the CBC apply to the construction, alteration, movement, replacement, and demolition of every building or structure or any appurtenances connected or attached to such buildings or structures throughout California.

The earthquake design requirements take into account the occupancy category of the structure, site class, soil classifications, and various seismic coefficients which are used to determine a Seismic Design Category (SDC) for a project. The SDC is a classification system that combines the occupancy categories with the level of expected ground motions at the site and ranges from SDC A (very small seismic vulnerability) to SDC E/F (very high seismic vulnerability and near a major fault). Design specifications are then determined according to the SDC.

Local

General Plan

The primary regulatory document for the City of Los Angeles is the Safety Element of the City of Los Angeles General Plan (1996). The objective of the Safety Element is to better protect occupants and equipment during various types and degrees of seismic events. In the Safety Element, specific guidelines are included for the evaluation of liquefaction, seismicity, non-structural elements, fault rupture zones and engineering investigation reports. The City's Emergency Operations Organization (EOO) helps to administer geological policies and provisions of the Safety Element, and is a City department comprised of all City agencies, pursuant to City Administrative Code, Division 8, Chapter 3. The Administrative Code, EOO Master Plan, and associated EOO plans establish the chain of command, protocols and programs for integrating all of the City's emergency operations, including earthquakes and other geological hazards, into one unified operation. Each City agency in turn has operational protocols, as well as plans and programs, to implement EOO protocols and programs related to geological hazard emergencies. A particular geological emergency triggers a particular set of protocols which are addressed by implementing plans and programs. The City's emergency operations program encompasses all of these protocols, plans and programs. Therefore, its programs are not contained in one comprehensive local or City document. The Safety Element goals, objectives and policies are broadly stated to reflect the comprehensive scope of the EOO. These include the following:

Goal 1: A city where potential injury, loss of life, property damage and disruption of the social and economic life of the City of Los Angeles due to fire, water related hazard, seismic event, geologic conditions or release of hazardous materials disasters is minimized.

Objective 1.1: Implement comprehensive hazard mitigation plans and programs that are integrated with each other and with the City's comprehensive emergency response and recovery plans and programs.

Policy 1.1.1 **Coordination:** Coordinate information, gathering, program formulation and program implementation between City agencies, other jurisdictions and appropriate public and private entities to achieve the maximum mutual benefit with the greatest efficiency of funds and staff.

Policy 1.1.2 **Disruption reduction:** Reduce, to the greatest extent feasible and within the resources available, potential critical facility, governmental functions, infrastructure and information resource disruption due to natural disaster.

Policy 1.1.3 **Facility/systems maintenance:** Provide redundancy (back-up) systems and strategies for continuation of adequate critical infrastructure systems and services so as to assure adequate circulation, communications, power, transportation, water, and other services for emergency response in the event of disaster related systems distributions.

Policy 1.1.4 **Health/environmental protection:** Protect the public and workers from the release of hazardous materials and protect City water supplies and resources from contamination resulting from accidental release or intrusion resulting from a disaster event, including protection of the environment and public from potential health and safety hazards associated with program implementation.

Policy 1.1.5 **Risk reduction:** Reduce potential risk hazards due to natural disaster to the greatest extent feasible with the resources available, including provision of information and training.

Policy 1.1.6 **State and Federal regulations:** Assure compliance with applicable state and federal planning and development regulations, e.g., A-P Earthquake Fault Zoning Act, State Mapping Act and Cobey-Alquist Flood Plain Management Act.

Other local regulatory documents that affect geological resources include the City Building Code and City Grading Standards. These documents include specific requirements for seismic design, slope stability, grading, foundation design, geologic investigations and reports, soil and rock testing, and groundwater. The City Department of Building and Safety is responsible for implementing the provisions of the Building Code and Grading Standards.

3E.3 Impacts and Mitigation Measures

Methodology

This section addresses the potential for structural damage to occur due to the local geology underlying the project area, as well as slope instability, ground settlement, unstable soil conditions, and regional seismic conditions. Geologic/geotechnical conditions affecting the site are summarized from compiled information and analyses, including referenced documents/publications and a site-specific geotechnical report, *Report of Geotechnical Engineering Services* (Geo Design Inc., September 26, 2005), prepared for the project provided in **Appendix F** of this EIR.

Significance Criteria

The criteria used to determine the significance of an impact are based on the Initial Study Checklist in Appendix G of the *CEQA Guidelines*. Several criteria were eliminated from further consideration and will not be discussed here. Please refer to the Initial Study (Appendix A) for further clarification.

For this analysis, the proposed project may result in significant impacts if it would:

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
  - Strong seismic ground shaking;
  - Seismic-related ground failure, including liquefaction;

  - Landslides;

- Result in substantial soil erosion or the loss of topsoil; or

- Be located on geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.

Project Impacts

Fault Rupture

The project area does not fall within an Alquist-Priolo special study zone or fault zone. No active or potentially active faults are located on the Occidental College Campus. Although the project area is not within a special Alquist-Priolo special study zone, this does not preclude local faults from serving as a potential seismic hazard. However, the proposed project would be constructed in accordance with the California Building Code seismic safety requirements and would be required to implement Mitigation Measure 3E.1, which requires that the recommendations of the Geotechnical Investigation be applied in the seismic design and construction of the proposed structures. Thus, this impact would be less than significant.

Seismicity

The most serious impacts associated with ground shaking would occur if the proposed structures were not properly constructed according to seismic engineering standards. The proposed buildings and structures would adhere to Title 24 of the California State Building Code in order to reduce the risk of structural collapse. These necessary compliance strategies, along with implementation of Mitigation Measures 3E.1 and 3E.2, would reduce potential impacts to less than significant.

Liquefaction

The potential for liquefaction depends on the levels of shaking, groundwater conditions, the relative density of soils, and the age of geologic units. Seismic-induced liquefaction occurs when a saturated, granular deposit of low relative density is subject to extreme shaking and loses strength or stiffness due to increase pore water pressure. The consequences of liquefaction are expected to be predominately characterized by settlement, uplift on structures, and increase in lateral pressure on buried structures. If building foundations are not designed properly, the effects of severe liquefaction during seismic conditions could produce failure, leading to substantial structural damage and injury or loss of life.

The City of Los Angeles is located in an area that has varying potential for liquefaction. According to the City of Los Angeles Zone Mapping and Information Access System (ZIMAS), the project site is considered to have a potential for liquefaction (City of Los Angeles, 2008). However, the proposed project is not located within a liquefaction hazard zone, as mapped by the State of California (California Department of Conservation, 2001). According to the geotechnical study performed by GeoDesign, Inc. for a site within the campus there was a very low potential for liquefaction hazards at that location (GeoDesign, 2005). Native soils were found to consist of very dense silty sand underlain by hard conglomerate bedrock of the Topanga Formation. The potential for liquefaction was considered minimal because the more dense the soil is, the potential for liquefaction decreases. In addition, the project area is located near a hillside, elevated above the local groundwater basin. Groundwater was not observed under the project area to depths of up to 65 feet below surface, although some groundwater seepage was noted. However, other areas of the campus, may encounter varying conditions that could be susceptible to liquefaction. Strong earthquakes can cause other secondary seismically induced ground failures including lateral spreading and ground lurching. Lateral spreading is horizontal displacement of weak soils or fill triggered by strong earthquake shaking and most commonly occurs when weak, saturated soils are bordered by steep embankments or slopes. Ground lurching occurs as earthquake-triggered horizontal movements on relatively steep embankments or slopes result in the cracking of the ground surface. Because the project area is located in the City of Los Angeles Slope Stability Study Area and is classified as being within a Hillside Area, the potential for lateral spreading or ground lurching is considered moderate. However, the massive nature of the bedrock and the favorable geologic structure preclude large scale, deep-seated mass movement of the on-site slopes that could cause a public safety hazard.

Furthermore, with implementation of Mitigation Measure 3E.1, which requires that the recommendations of a Geotechnical Investigation be applied in the seismic design and construction of the proposed structures, this potential impact would be less than significant.

Landslides

According to the City of Los Angeles Safety Element and the County of Los Angeles Seismic Safety Element, the campus is classified as being within a "hillside area." The project area is also located in a City of Los Angeles Slope Stability Study Area, as designated by the City of Los Angeles Planning Department. There are no known landslides near the project area nor is the project area located in the path of any known or potential landslide. Implementation of the geotechnical recommendations required by Mitigation Measure 3E.3 would ensure that the potential for landslides or slope stability to affect the project during construction and thereafter if less than significant.

Soil Erosion

Since the proposed project would be constructed on previously developed land with buildings and other sports structures and has been previously graded, loss of topsoil would not be a significant impact. Construction activity associated with the project components may result in minor wind and water driven erosion of soils. This is considered short-term in nature, as the project area would be landscaped and would contain hardscape surfaces and turf upon completion. Furthermore, construction of the proposed project would involve excavation and hauling materials off the site. These activities may result in soil erosion impacts on off-site areas, such as nearby streets and storm drains. However, implementation of project components would be subject to State Water Resources Control Board requirements for erosion control under the National Pollutant Discharge Elimination System (NPDES) permit program. Compliance by the project proponent with this program and the conditions of the General Construction permit along with the use of standard Best Management Practices (BMPs), such as dust control, hauling all excess soil to safe disposal sites and frequently watering construction site ground soil, erosion impacts would be less than significant. Implementation of Mitigation Measure 3E.4 would ensure compliance with NPDES permit program and the implementation of BMPs.

Geologic Unit

The massive nature of the bedrock and the favorable geologic structure at the project site preclude large scale, deep-seated mass movement of the surface and subsurface foundation that could cause structural collapse and lateral spreading. Furthermore, with implementation of Mitigation Measure 3E.1, which requires that the recommendations of the Geotechnical Investigation be applied in the seismic design and construction of the proposed structure, this impact would be less than significant.

Expansive Soils

The geotechnical investigation reports for individual sites on the campus specifiy recommendations for geotechnical issues associated with development on the campus to reduce impacts caused by expansive soil. All geotechnical recommendations shall be incorporated into the project design for each BOS and adhered to during the construction of the project. The project is not located in an area that has been identified as having a high potential for soil expansion. Thus, no significant impacts resulting from expansive soil hazards are anticipated.

3E.4 Mitigation Measures

All of the following mitigation measures are required to reduce potential impacts to geology.

Measure 3E.1: To minimize the effects of ground shaking from a significant earthquake on new and renovated structures, each building shall have a California certified engineering geologist or geotechnical engineer prepare a soils and geologic engineering report for each site as each Building Opportunity Site as they are proposed for development. This report shall include analysis of all geologic hazards and soil conditions and shall be submitted for review and approval by the City of Los Angeles. All construction shall adhere to all recommendations advanced in the City approved report.

Measure 3E.2: Construction and/or renovation of all structures shall be required to meet California Building Code design and construction standards.

Measure 3E.3: The applicant shall include the recommendations related to slope stability made in all the geotechnical investigations prepared for the site as part of the proposed project. These recommendations include oversight of earthwork operations, temporary shoring, and final site grading which shall be conducted by a California Certified Engineering Geologist or Registered Professional Geotechnical Engineer.

Measure 3E.4: The applicant shall prepare a Storm Water Pollution Prevention Plan (SWPPP) for the site in accordance with National Pollution Discharge Elimination System (NPDES) requirements and comply with erosion and sediment control measures therein.

The SWPPP shall identify Best Management Practices (BMPs) for implementation during construction activities to reduce the potential for soil erosion. The SWPPP shall be incorporated into project specifications.

Measure 3E.5: The applicant shall obtain a haul route approval for export/import in excess of 1,000 cubic yards prior to submittal of grading permits to the Department of Building and Safety grading. All haul route hours shall be limited to off-peak hours as determined by Board of Building & Safety Commissioners.

Measure 3E.6: Environmental impacts may result due to the proposed project's location in an area with liquefaction potential. However, these potential impacts will be mitigated to a level of insignificance by the following measures:

- The project shall comply with the Uniform Building Code Chapter 18. Division 1 Section1804.5 Liquefaction Potential and Soil Strength Loss, which requires the preparation of a geotechnical report. The geotechnical report shall assess potential consequences of any liquefaction and soil strength loss, estimation of settlement, lateral movement or reduction in foundation soil-bearing capacity, and discuss mitigation measures that may include building design consideration.
- Building design considerations shall include, but are not limited to: ground stabilization, selection of appropriate foundation type and depths, selection of appropriate structural systems to accommodate anticipated displacements or any combination of these measures.

Measure 3E.7: Environmental impacts may result from the project's hauling operations and shall be reduced to a less than significant level by the implementation of the following mitigation measures:

- Los Angeles Department of Building and Safety (LADBS) shall assign specific haul route hours of operation based upon hours of operation of schools in the area.
- The applicant shall provide a staked signage at the site with a minimum of 3-inch lettering containing contact information for the Senior Street Use Inspector (Department of Public Works), the Senior Grading Inspector and the hauling or general contractor.
- The developer shall install appropriate traffic signs around the campus to ensure pedestrian and vehicle safety.
- LADBS shall require the applicant to have all employees park their personal vehicles on campus.
- LADBS shall stagger haul trucks based upon a specific area's capacity, as determined by LADOT, and the amount of soil proposed to be hauled to minimize cumulative traffic and congestion impacts.
- The City of Los Angeles Department of Transportation (LADOT) shall recommend to the Building & Safety Commission Office the appropriate size of trucks allowed for hauling, best route of travel, the appropriate number flag people.
- Trucks having no current hauling activity shall not idle but be turned off.
- All construction staging shall be on-campus.
- No parking shall be permitted on City streets during Red Flag Days in compliance with the "Los Angeles Fire Department Red Flag No Parking" program.

- In order to preserve adequate access for emergency vehicles, all construction material shall be stored on-campus and not on the street during hauling operations.
- The applicant shall provide a soils and/or geotechnical report to LADBS (reports needed to be determined by LADBS) for review and approval that shall include measures to mitigate impacts related to grading.
- Fences shall be constructed around each construction site to minimize trespassing, vandalism, short-cut attractions and attractive nuisances.

3E.4 Cumulative Impacts

The impact of proposed development on the Occidental College Campus on geology and soils is localized and would not affect the immediate vicinity surrounding the project area. The proposed project and related projects would all be constructed in accordance with the California Building Code seismic safety requirements and recommendations contained in the project area specific geotechnical reports. Therefore, impacts to area geology and soils resulting from construction and operation of the proposed project would not result in a cumulatively considerable impact.

3E.5 Significant Impacts after Mitigation

Less than significant.